

# NASA TECH BRIEF



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## Adherent Protective Coatings Plated on Magnesium-Lithium Alloy

**The problem:** Depositing an adherent protective plate on magnesium-lithium alloy LA-141 (14 Li, 1 Al, 85 Mg). Plating with zinc or copper for grounding or r-f sealing of structural components of the alloy is desirable. Copper cannot be directly plated on the alloy, and a standard immersion process for zinc plating results in a powdery nonadherent deposition.

**The solution:** Zinc can be satisfactorily plated on the magnesium-lithium alloy using a modification of the standard zinc-plate immersion bath. Further protection is given the alloy by striking (applying a light plating) of copper on the zinc plating. Other metals can be plated on the copper using conventional plating baths.

**How It's done:** Sodium carbonate used in the standard immersion bath is replaced with sodium acetate to adjust the pH to 7.5 to 8.0. The modified bath, maintained at a temperature of 165° to 185°F, has the following composition in grams per liter:

Zinc sulfate monohydrate, 30  
Anhydrous sodium pyrophosphate, 120  
Sodium fluoride, 5  
Sodium acetate (crystals), 10.

The part to be zinc plated is cleaned in a series of steps consisting of vapor degreasing, anodic alkali treatment, cold-water rinsing, immersion in dilute nitric or hydrochloric acid, and a second rinsing with cold water. After completion of these steps, the part is immersed in the plating bath until it is covered with a uniform blue-gray zinc plate (a period of 2 to 20 minutes). The plated part is then rinsed in cold water.

The zinc-plated part is electroplated with copper for approximately 15 minutes at a current density of 15 amperes per square foot. The copper-plating bath,

maintained at a pH of 9.6 to 10.4 and a temperature of 130° to 140°F, has the following composition in ounces per gallon:

Copper cyanide, 5.5

Potassium cyanide, approximately 9.0 (to provide 1.0 ounce per gallon of free cyanide ions)

Potassium fluoride, 4.0.

The copper-plated part is rinsed with cold and hot water, dried, and then baked at 400° ( $\pm 10^\circ$ ) F for 1 hour. The cooled part is then given a second copper plating in the above bath and finally rinsed with cold water.

### Notes:

1. The anodic cleaning of the alloy, preparatory to plating with zinc, is performed in a commercial alkaline solution at 180°F, using a dc potential of 6 volts for 5 minutes.
2. Some of the properties and uses of alloy LA-141 are described in NASA Tech Brief B63-10389, June, 1964.
3. Inquiries concerning this invention may be directed to:

Technology Utilization Officer  
Marshall Space Flight Center  
Huntsville, Alabama, 35812  
Reference: B65-10294

**Patent status:** NASA encourages the immediate commercial use of this invention. It is owned by NASA and inquiries about obtaining royalty-free rights for its commercial use may be made to NASA Code AGP, Washington, D.C., 20546.

Source: International Business Machines  
under contract to  
Marshall Space Flight Center  
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